

Letter to the editor: Disorder is in the Eye of the Beholder?!

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Does the second law of thermodynamics prohibit evolution by natural selection and other mechanisms? If you have been in an introductory science class anytime in the last decade or more you have been told that the word “theory” does not mean the same thing to scientists that does to the layperson. There is a good reason for this sometimes repetitive mantra in modern science classes, and the reason has to do with wide spread public rejection of well supported scientific theories. Recent polls show as much as 40% of the American public rejects evolution and the big-bang theories [Gallup (2012)]. Young-earth creationists, as they are called, have been debunked time and again by hard evidence and sound science but the idea that evolution or the big-bang is “just a theory” has persisted in creationist literature and the public at large [Answers in Genesis (n.d)]. In light of this it is understandable for the scientific community to emphasize the differences in meaning of the word theory as it relates to science. It should also come as no surprise that other words, which might have a different definition in science than in everyday life, are misconstrued to fit creationist propaganda.

The misunderstanding around the meaning of the word entropy in physics, and the metaphor of disorder often used to describe the concept, has led to some confusion about how to in-

interpret entropy and the role it plays in evolution. The metaphor of disorder is often useful when describing entropy in introductory science classes since in general more entropy is perceived by humans as more disorderly. This is only a metaphor however and should not be taken as a definition of the physical principle of entropy [Styer, D. F. (2008, 12)]. I claim that most people would look at a broken cup and a cup which has been ground into a sand like consistency; and see more disorder in the broken cup than the pile of sand. This does not mean that there is more entropy in fact the opposite is true. The cup that is ground to sand would be more disorderly if disorderly is to mean more entropy is present in the system [Schroeder, D. V. (2000), pg. 75]. Using disorder to describe entropy is useful but can have its setbacks if we are not careful about how our perception of disorder can be misleading. Creationists often use the public's lack of familiarity with the scientific use of the word disorder when describing the second law to claim that the second law of thermodynamics prohibits evolution of more complex forms from less complex ancestors[christiananswers.net (2012)]. Creationists have claimed that since the second law dictates that the state of a closed system go from order to disorder over time, then evolution is not permitted. This is false since the increase in the disorder , or entropy, of the Sun far outweighs any decreases necessary for evolution to occur, regardless of which we perceive to be more significant [Bunn, E. F. (2009, 12)].

I hope this letter will make it clear to your readers why is it important to understand the difference between how scientists define words and how these words are used in everyday life. I also hope that I have clarified some of the misconceptions about entropy and evolution so that your reader will not be mislead to believe that evolution is prohibited by the second law of thermodynamics.

References

- [Answers in Genesis (n.d)] "Evolution: Not Even a Theory." Retrieved March 27, 2015, from *.fromhttps : //answersingenesis.org/theory - of - evolution/evolution - not - even - theory/*
- [Gallup (2012)] "In U.S., 46% Hold Creationist View of Human Origins." In U.S., 46 % Hold Creationist View of Human Origins. Web. 25 Feb. 2015.*http : //www.gallup.com/poll/155003/Hold - Creationist - View - Human - Origins.aspx?utm_source = alert&utm_medium = email&utm_campaign = syndication&utm_content = morelink&utm_term = Religio*
- [Schroeder, D. V. (2000)] Schroeder, D. V., *An introduction to thermal physics* (Addison Wesley, CA 2000)
- [Styer, D. F. (2008, 12)] Styer, D. F., "Entropy and evolution." American Journal of Physics, 76(11), 1031. doi: 10.1119/1.2973046 (2008), Web :*http : //scitation.aip.org/content/aapt/journal/ajp/76/11/10.1119/1.2973046*
- [Bunn, E. F. (2009, 12)] Bunn, E. F., "Evolution and the second law of thermodynamics." American Journal of Physics, 76(11), 1031. Physics, 77(10), 922. doi:10.1119/1.3119513
- [christiananswers.net (2012)] "Second Law of Thermodynamics-Does this basic law of nature prevent Evolution?" (n.d.). Retrieved February 25, 2015, from *.http : //www.christiananswers.net/q - eden/edn - thermodynamics.html*